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## CHEM 2412 - Organic Chemistry II

### Course Syllabus - Spring 2017

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Individuals with disabilities who need to request accommodations should contact the Disability Services Coordinator, Student Center 214, 678-466-5445, [disabilityservices@mail.clayton.edu](mailto:disabilityservices@mail.clayton.edu).

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**Course Description:  
Number and Title:**

CHEM 2412(CRN [20301](#))  
Organic Chemistry II

**Credit Hours:**

3.0 semester credit hours

**Course Description:**

A continuation of Chemistry 2411 to include the study of the common classes of carbon compounds, including their physical and chemical properties, methods of preparation, and reactions utilizing modern theories of electronic structure and reaction mechanisms.

**Course Prerequisite:**

CHEM 2411 and CHEM 2411L with a grade of C or better.

**Course Co-requisite:**

Co-requisite: CHEM 2412L.

**Note: Due to the co-requisite nature of CHEM 2412 and CHEM 2412L, students dropping one of the two courses must also drop the other.**

**Notebook Computer Requirement:**

Each CCSU student is required to have ready access throughout the semester to a notebook computer that meets faculty-approved hardware and software requirements for the student's academic program. Students will sign a statement attesting to such access. For further information on CSU's Official Notebook Computer Policy, please go to <http://itpchoice.clayton.edu/policy.htm>.

**Computer Skill Prerequisites:**

- Able to use the computer's operation system (Windows®)
- Able to access and send e-mail (Outlook® or Outlook Express®)
- Able to use a Web browser (Internet Explorer®) and search engine
- Able to download files from a web site to your computer
- Able to use a word processor system (Word®)
- Able to use a spread sheet system (Excel®)

**In-class Use of Student Notebook Computers:**

Student notebook computers will not be used in the classroom in this course. Computers will be required to access course materials and to communicate with your instructor.

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**Course Learning Outcomes:**

A successful student will be able to:

- demonstrate an understanding of the basic principles of organic chemistry, including structure, bonding, physical properties and stereochemistry.
  - properly name organic molecules.
  - identify organic reactions and apply them to multistep syntheses.
  - identify and predict plausible mechanisms for organic reactions.
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**Student Learning Outcomes:****General education outcomes:**

- Communication: knowledge base: CHEM 2411 will provide knowledge base information necessary for communication of information concerning principles of organic chemistry.
- Critical Thinking: Question/Issue, Method, Evidence, Conclusion: CHEM 2411 will provide problem solving skills in the area of organic chemistry. Students will be required to assess information given in a scientific problem and form a conclusion based on that information. In this process, students will be required to determine which given information is pertinent and if their conclusion is reasonable.

**Chemistry Outcomes:**

CHEM2412 supports outcomes 1, 2, 3, and 5 of the chemistry minor:

- Outcome 1. To develop more experience with problem solving in chemistry courses and labs.

- Outcome 2. To participate in interdisciplinary learning through the opportunity to apply analytical techniques learned in the chemistry courses to upper level courses in other disciplines.
- Outcome 3. To learn more about chemical systems and to apply this knowledge to scientific questions.
- Outcome 5. To provide better preparation for graduate and professional schooling.

**Biology Outcomes:**

Outcome 3: Apply knowledge of physical sciences, mathematics, and statistics to biological concepts.

**Instructor Information:**

Dr. Susan F. Hornbuckle  
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 Internet: [www.susanhornbuckle.com](http://www.susanhornbuckle.com)  
 Office: LDS 235B

On Campus Office hours:	1:00 PM – 3:00 PM	M
	8:40 AM – 9:40 AM	T,Th
	12:40 PM – 2:40 PM	Th

\*You may phone, email or talk to me in person to make an appointment.

**Class Meetings:**

Days	Times	Room
T,R	11:15 AM - 12:30 PM	LDS 155

**Textbook Information:**

**Text:**

Organic Chemistry (**Required**)  
 by David Klein  
 Edition 2  
 ISBN 978-1-118-45228-8  
[PRENTICE HALL MOLECULAR MODEL SET FOR ORG CHEM \(Required\)](#)  
 by PRENTICE HALL  
 Copyright 1984  
 ISBN 0-205-08136-3

**Text Coverage:**

Chapters 9 - 13, 20, 21, 23, 18, 19, 14, 22

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**Evaluation:**

Your evaluation in CHEM 2412 will be based upon the following components:

component	points
Classroom Assessments 3 x 100 points	300
Group Homework in D2L 10 x 10 points	100
Comprehensive Final Exam	<u>200</u>
Total	600

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**Grading:**

The grade you receive in Chemistry 2412 will be based upon the following distribution:

letter grade	percentage range
A	90% or greater
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	< 60%

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**Mid-term Progress Report**

The mid-term grade in this course which will be issued on March 1st, reflects approximately 20% of the entire course grade. Based on this grade, students may choose to withdraw from the course and receive a grade of "W." Students pursuing this option must fill out an official withdrawal form, available in the Office of the Registrar, by mid-term, which occurs on March 3rd.

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### Tentative Course Schedule\*:

Date	Lecture Topics	Chapter	Textbook Assigned Problems
January 10	Syllabus and start Chapter 9		
January 12, 17, 19	Addition Reactions of Alkenes 9.1 - Introduction 9.2 - Addition vs. Elimination 9.3 - Hydrohalogenation 9.4 - Acid-Catalyzed Hydration 9.5 - Oxymercuration-Demercuration 9.6 - Hydroboration-Oxidation 9.7 - Catalytic Hydrogenation 9.8 - Halogenation and Halohydrin 9.9 - Anti Dihydroxylation 9.10 - Syn Dihydroxylation 9.11 - Oxidative Cleavage 9.12 - Predicting Products 9.13 - Synthesis Strategies	9	9: 1-9,69,72,76 9: 10-14,64 9: 15,16,51 9: 17-22,66 9: 23-25,55,61,75,52 9: 26-29,73,81,82,83 9: 30-32,63,79 9: 33,65 9: 34,35,56,68,77,78,80 9: 36-39,49,50,59 9: 40-47,53,54,57,58,60,62,67,70,71,74
January 24, 26, 31	Alkynes 10.1 - Intro 10.2 - Nomenclature (covered in CHEM2411) 10.3 - Acidity of Terminal Alkynes 10.4 - Prep. of Alkynes 10.5 - Reduction of Alkynes 10.6 - Hydrohalogenation of Alkynes 10.7 - Hydration of Alkynes 10.8 - Halogenation of Alkynes 10.9 - Ozonolysis of Alkynes 10.10 - Alkylation of Terminal Alkynes 10.11 - Synthesis Strategies	10	- - 10: 5-6,39,42 10: 7-8 10: 9-12,37,38,47,49 10: 13-15 10:16-24,43,44,52,63,64,66,67 - 10: 25-27,55 10: 28-31,40,46,50,54,59 10: 32-34,41,45,48,53,56-62,65
February 2	Radical Reactions 11.1 - Radicals 11.2 - Common Patterns in Radical Mechanisms 11.3 - Chlorination of Methane	11	11: 1-6,22-25,29 11: 7-9,42,48 11: 10-11
February 7**	Exam 1		
February 9, 14	Radical Reactions continued 11.4 - Thermodynamic Considerations 11.5 - Selectivity of Halogenation 11.6 - Stereochemistry of	11	- 11: 12-13,27,38,40,43,44 11: 14-15,34,35,41

	Halogenation 11.7 - Allylic Bromination 11.8 - omit 11.9 - omit 11.10 - Radical Addition of HBr 11.11 - omit 11.12 - omit 11.13 - omit		11: 16-17,26,28,31-33,36,39 - - 11: 20-21 - -
February 16	12.1 - One-Step Synthesis 12.2 - Functional Group Transformations 12.3 - Reactions That Change the Carbon Skeleton 12.4 - How to Approach a Synthesis Problem 12.5 - Retrosynthetic Analysis 12.6 - Practical Tips for Increasing Proficiency	12	12: 1-2 12: 3-6,17,21,22 12: 7-9,18 12: 10-12 12: 13-16,19-26 12: 27,28,30,41
February 21	13.2 – Acidity of Alcohols and Phenols (Review) 13.3 – Preparation of Alcohols via Substitution or Addition (Review) 13.4 – Preparation of Alcohols via Reduction 13.5 – Preparation of Diols (Review) 13.6 – Preparation of Alcohols via Grignard Reagents	13	13: 4-6,33,34 13: 7-8,36 13: 9-13,46,60,62  13: 14-17,38,40,43,50,58
February 23, 28 March 2	13.7 - Protection of Alcohols 13.8 - omit 13.9 - Reactions of Alcohols: Substitution and Elimination (Review) 13.10 - Reactions of Alcohols: Oxidation 13.11 - omit 13.12 - omit 13.13 - Synthesis Strategies NMR Problems (Review)	13	13: 18  13: 19-21,44,47,52r 13: 22,23,37,42  13: 24-29,35,37-39,45,48,49,51,52,59 13: 53-56
March 14, 16, 21	20:3 - Preparing Aldehydes and Ketones: A Review 20.4 - Introduction to Nucleophilic Addition Reactions 20.5 - Oxygen Nucleophiles 20.6 - Nitrogen Nucleophiles 20.7 - Hydrolysis of Acetals, Imines, and Enamines 20.8 - Sulfur Nucleophiles 20.9 - Hydrogen Nucleophiles 20.10 - Carbon Nucleophiles 20.11 - Baeyer-Villiger Oxidation of Aldehydes and Ketones 20.12 - Synthesis Strategies 20.13 - Spectroscopic Analysis of Aldehydes and Ketones (Review)	20	20: 5 20: 6,50 20: 7-14,57,62,67 20: 15-25,64,66,72 20: 26,27,63-65 20: 29,30 20: 31,32 20: 33-39,51-54,60 20: 40 20: 41,42,55,56,58,61,67-69,71,75,78,89 20: 43,80-83
March 23, 28, 30	21.3 - Structure and Properties of Carboxylic Acids 21.4 - Preparation of Carboxylic Acids	21	21: 4-9  21: 10

	21.5 - Reactions of Carboxylic Acids 21.6 - Introduction to Carboxylic Acid Derivatives 21.7 - Reactivity of Carboxylic Acid Derivatives 21.8 - Preparation and Reactions of Acid Chlorides		21: 11,49,60 21: 12-13 21: 14-17,61,72 21: 18-20,48,61
April 4***	Exam 2		
April 6	21.9 - Preparation and Reactions of Acid Anhydrides 21.10 - Preparations of Esters 21.11 - Reactions of Esters 21.12 - Preparation and Reactions of Amides 21.13 - Preparation and Reactions of Nitriles 21.14 - Synthesis Strategies 21.15 - Spectroscopy of Carboxylic Acids and Their Derivatives	21	21: 21,59 21: 22,23 21: 24,25,51,52 21: 26-28,50,65 21: 29-31 21: 32-37,45,46,52,53,55,57,58,73,74 21: 38,76-80
April 11, 13	23.3 - Properties of Amines 23.4 - Preparation of Amines: A Review 23.5 - Preparation of Amines via Substitution Reactions 23.6 - Preparation of Amines via Reductive Amination 23.7 - Synthesis Strategies 23.8 - Acylation of Amines 23.9 - Hofmann Elimination 23.10 - Reactions of Amines with Nitrous Acid 23.11 - Reactions of Aryldiazonium Ions 23.12 - OMIT 23.13 - Spectroscopy of Amines	23	23: 4-9,40,41,43,48 23: 10,11 23: 12,13 23: 14-17,65,66 23: 18-21,49-51,62,63,70,86 23: 22-24 23: 25-28,57,69,78 23: 29 23:30-33,68,73 23: 36,37,83,84
April 18	18.1 - Introduction to Aromatic Compounds 18.2 - Nomenclature of Benzene Derivatives 18.3 - Structure of Benzene 18.4 - Stability of Benzene 18.5 - Aromatic Compounds other than Benzene 18.6 - Reactions at the Benzylic Position 18.7 - Reduction of the Aromatic Moiety 18.8 - Spectroscopy of Aromatic Compounds	18	18:1-5,28,29,33 18: 6-8 18: 10-17,34,36,38,41,44,52,62,64 18: 19-23,47,56,58 18: 24,25,49,50 18: 26,27,57,59,60,63
April 20, 25	19.1 - Introduction to Electrophilic Aromatic Substitution 19.2 - Halogenation 19.3 - Sulfonation 19.4 - Nitration 19.5 - Friedel-Crafts Alkylation 19.6 - Friedel-Crafts Acylation 19.7 - Activating Groups 19.8 - Deactivation Groups	18	19:1 19: 2,3 19: 4 19: 5-7 19: 8-10 19: 11,12 19: 13 19: 14,15

	19.9 - Halogens: The Exception 19.10 - Determining the Directing Effects of a Substituent 19.11 - Multiple Substituents 19.12 - Synthesis Strategies 19.13 - omit 19.14 - omit 19.15 - omit		19: 16-18,44-46,49,64,66 19: 19-27,47,50,56,59,63,69 19: 28-34,57,58,68,73,75
April 27	Exam 3**		
TBA	<b>Comprehensive Exam</b>	Final Exam	

\*The instructor reserves the right to alter the course schedule at any time during the semester.

\*\*Assessments will be announced **in class** as least one week before each assessment.

### Course Policies:

#### Homework:

Each student will be assigned to a group at the start of the semester. Groups will be assign problems for each chapter (and nomenclature). The following process shall occur for each assignment:

1. Each member of the group should work all of the assigned group problems.
2. The group should meet to compare answers.
3. Once answers are agreed upon, the group should divide up the problems as evenly as possible and each group member should post the answers to these questions on the appropriate discussion board in D2L. This will typically require taking a picture of your work or scanning it to create the post. Deadlines for this step will be posted in D2L and announced in class. (6 points)
4. Each student should then comment on at least 8 problems posted by other groups. Deadlines for this step will be posted in D2L and announced in class. (4 points)

Students are encouraged to work all recommended problems listed in the syllabus.

#### Attendance:

Class roll will be taken, however, attendance is not required except for classroom assessments. You are responsible for all attendance requirements for external programs (i.e. financial aid). It is your responsibility to sign the roll sheet at every class meeting you attend. This roll sheet is the instructor's official record. You will be held



responsible for all announcements and material covered in lecture in addition to text, references, hand-outs and study guides. Note: Lectures will contain valuable explanations of content and thought processes which are difficult for most students to extract from the text book on their own. Therefore, regular attendance is strongly encouraged.

### **Academic Irregularity:**

Cheating in any form will not be tolerated. Consequences may include a zero grade on the assessment instrument, or possible action by the College Judicial Board of Review.

### **Assessments:**

There will be three (3) classroom assessments and one 2-hour final (comprehensive). The assessments will be announced approximately one week in advance whenever possible and attendance is mandatory. If a student has an excused absence on an exam day, the student's final exam percentage score will be used in place of the missed exam score. No make-up exams will be given.

**Grades will not be communicated via email or telephone. Exams will be handed back in the next lecture period after an exam. If absent, a student must come by during office hours to retrieve their exam. Final exam papers may be viewed the following semester during office hours.**

### **Disruption of the Learning Environment:**

Behavior which disrupts the teaching–learning process during class activities will not be tolerated. While a variety of behaviors can be disruptive in a classroom setting, more serious examples include belligerent, abusive, profane, and/or threatening behavior. A student who fails to respond to reasonable faculty direction regarding classroom behavior and/or behavior while participating in classroom activities may be dismissed from class. A student who is dismissed is entitled to due process and will be afforded such rights as soon as possible following dismissal. If found in violation, a student may be administratively withdrawn and may receive a grade of WF. A more detailed description of examples of disruptive behavior and appeal procedures is provided at: <http://a-s.clayton.edu/DisruptiveClassroomBehavior.htm>

### **Other Class Policies:**

"Students must abide by policies in the [Clayton State University Student Handbook](#), and the [Basic Undergraduate Student Responsibilities](#)."

- Arrive to class on time.
- Avoid disruptive behavior in class: talking, snoring, children, etc.
- Turn off phones, radios and other electronic devices.

- If you must leave early, leave quietly by a back door if possible.
- Use the pencil sharpener before class begins.
- No eating, smoking or drinking in the classrooms.
- No extra credit work will be assigned.